REMARKS

Claims 1, 2 and 4-11 are pending in this application. By this Amendment, claims 1, 5 and 7-11 are amended.

The Office Action (i) rejects claims 1, 2, 4 and 10-11 under 35 U.S.C. §103(a) over U.S. Patent 6,801,220 to Greier et al. (Greier) in view of U.S. Patent 6,392,642 to Wu, and further in view of U.S. Patent 5,877,737 to Kim et al. (Kim); (ii) rejects claims 5-6 and 8-9 under 35 U.S.C. §103(a) over Greier in view of U.S. Patent 5,905,482 to Hughes et al. (Hughes), and further in view of U.S. Patent 5,402,149 to Amagami et al. (Amagami); and (iii) rejects claim 7 under 35 U.S.C. 103(a) over Greier in view of Wu. These rejections are respectfully traversed.

Greier does not disclose or suggest that adjacent pixels have same grayscale values after converting the resolution, and that a viewing angle range adjustment device sets grayscale values of the adjacent pixels so that the grayscale values of the adjacent pixels are different from each other. Wu, Kim, Hughes and Amagami also do not disclose such a combination of features. According to the combinations of features recited in Applicants' independent claims would not have been obvious in view of the applied references.

Greier discloses adjusting subpixel intensity based on luminance characteristics and initial intensity values of the subpixels. This is done to shift subpixel intensity values from mid-tone levels, which provide non-ideal viewing angle and color characteristics, to either bright or dark intensity levels (col. 4, lines 62-66) in order to improve viewing angle characteristics. This adjustment is done by pixel groups with average luminance preserved in local areas (col. 12, line 61 to col. 13, line 4). Additionally, in order to prevent flicker, the adjustment of grayscale values to bright or dark can be done in a pattern of bright and dark pixels or subpixels in conjunction with an inversion pattern which determines voltage polarity of the pixels or subpixels (col. 13, lines 46-55). For example, Greier discloses a pattern in which the grayscale values of pixels are adjusted to be bright or dark according to a

checkerboard pattern (see Fig. 15, showing bright pixels as white and dark pixels as cross-hatched). Greier does not disclose changing image size. Thus Greier discloses adjusting the grayscale levels of pixels and subpixels when the input image is the same size as the displayed image.

Wu discloses a hardware-based solution for adjusting horizontal image resolution (abstract). A displaying circuit 58 varies a pixel clock 59 which determines the sampling rate of video signals 16 (Fig. 6; col. 3, lines 60-62), thereby adjusting the sampling rate to accommodate the horizontal resolution of the display. Wu is silent regarding any adjustment of the vertical resolution of images. Further, given the technology for transmitting images by video scan lines and Wu's disclosed circuits, modifying the disclosure of Wu for vertical adjustment of image resolution would be a non-obvious endeavor.

Kim discloses a wide viewing angle driving circuit 31 that includes first gray level voltage generator 301 and second gray level voltage generator 302 generating sets of first and second grayscale voltages, respectively (col. 2, line 60 to col. 3, line 3). Each of the gray level voltage generators 301 and 302 has a plurality of resistors, such as R0-Rn+1 (Fig. 5a-5b) connected in series. The plurality of resistors are supplied the maximum or minimum grayscale voltages and output a scaled set of grayscale voltages (col. 2, line 62 to col. 3, line 3). An analog distributor 303 supplies the first grayscale voltages to a first set of pixels to achieve a first viewing angle characteristic and supplies the second gray level voltages to a second set of pixels to achieve a second viewing angle characteristic, alternating the sets of pixels to which the grayscale voltages are applied to control signals A and B (col. 3, lines 3-9). The first and second sets of pixels can be in various relationships, which include a checkerboard pattern as shown in Fig. 1A (col. 4, line 65 to col. 5, line 3). In order to implement the disclosure of Kim, the peripheral driving circuits of an LC display would need to be modified (abstract, see also Fig. 3, the upper source driver 32 and lower source driver 35). Kim does not disclose setting the grayscale of the first and second sets of pixels to

achieve -30 degree or +30 degree viewing angle characteristics. However, the Office Action alleges that this is merely an optimization which was within the skill of one of ordinary skill at the time of the invention and thus obvious over Kim.

Hughes discloses a ferroelectric liquid crystal display utilizing chiral smectic liquid crystal material between two glass cell walls (col. 5, lines 17-20) to provide grayscale values of adjacent subpixels can be varied to change the apparent relative size of the two adjacent subpixels (col. 4, lines 31-33) to compensate for limits in manufacturing processes (col. 3, lines 20-23).

Amagami discloses expanding a display data for a low resolution matrix display apparatus to display data for a high resolution matrix display apparatus without causing a reduction in the speed of processing and without requiring clocks of different frequencies (Abstract).

Regarding the claims, Greier fails to disclose (1) a resolution conversion device that converts original image data for a pixel to resolution-converted image data of two adjacent pixels (all claims); (2) in a case that a vertical observation direction to a surface of the display unit is a 0 degree observation direction, the viewing angle range adjustment device sets grayscale value of one of the pixel and the adjacent pixel based on display characteristics of a -30 degrees observation direction and sets grayscale value of the other one of the pixel and the adjacent pixel based on display characteristics of a +30 degrees observation direction (independent claims 1 and 10-11); and (3) that after converting the resolution, the adjacent pixels have the same grayscale values and after the viewing angle adjustment device sets grayscale values ... so that the grayscale values of the adjacent pixels differ from each other (all claims).

Regarding independent claims 1, 7 and 10-11, Wu fails to cure the deficiencies of Greier. Wu is implemented in hardware, is designed to be connected between a computer and a monitor, and is targeted at adjusting the horizontal resolution in response to a detected

number of horizontal scan lines. In contrast, Greier is implemented in software (with an intended purpose to avoid hardware modifications, see col. 4, lines 23-25), and is directed to improving viewing angle characteristics of a display. Further, the Office Action only concludes that it would have been obvious to combine the adjustment of the image data as taught by Wu with the adjustment of subpixel luminoscities as taught by Greier without citing any suggestion or motivation to combine the references (page 5). Thus, (1) Greier and Wu are not analogous art as alleged by the Office Action, (2) the Office Action is merely combining references without establishing a *prima facie* case of obviousness; and (3) even if the disclosure of Greier is modified according to Wu, Wu discloses altering the sampling rate and thus does not produce adjacent pixels having the same grayscale value after resolution conversion.

Further regarding independent claims 1 and 10-11, the Office Action impermissibly combines the disclosure of Kim with that of Greier and Wu. The disclosed wide viewing angle driving circuit 31 of Kim is hardware-based, requires modification of the existing hardware of an LCD panel to be implemented, is directed to improving the horizontal viewing angle of LCDs based on voltage applied to pixels and not subpixels, and is not adjustable once implemented. Additionally, it would not have been obvious to modify the device of Kim to use the display characteristics for a -30 degrees and +30 degrees observing angle because Kim discloses that the grayscale voltages are produced from fixed pluralities of resistors and, further, that these resistors produce the output grayscale voltages based on the maximum brightness level possible and not on a characteristic of a viewing angle. Thus, it would not have been obvious to modify the device of Greier in view of Kim because (1) even if combined, all recited features are not disclosed, and (2) the resultant modification would render the device of Greier unsuitable for its intended purpose by necessitating hardware modifications.

Regarding independent claims 5 and 8-9, the Office Action has impermissibly modified the disclosure of Greier with that of Hughes because such a modification would render the disclosure of Greier unsuitable for its intended purpose. Hughes is directed to ferroelectric displays having specific structure and materials. Because Greier is directed to a method of adjusting grayscale luminocities without requiring hardware modification, modifying the device of Greier in view of Hughes would render the device of Greier unsuitable for its intended use. Amagami does not cure the deficiencies of Greier and Hughes.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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Attachment:
Request for Continued Examination

Date: January 5, 2007

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